15th Annual

NONPOINT SOURCE WATER-QUALITY MONITORING RESULTS WORKSHOP

ABSTRACTS

January 4–6, 2005

Boise State University
Student Union Building
Boise, Idaho

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Idaho Department of Fish & Game
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TUESDAY, JANUARY 4, 2005

1:00–2:00 pm ***KEYNOTE SPEAKER*****: G. Wayne Minshall, Idaho State University**
NPS Effects of Fire on Idaho Wilderness Streams: A Long-Term Perspective
–Abstract unavailable

2:00–2:20 pm Richard Inouye, Idaho State University
Who's Pooping in the Portneuf? Temporal and Spatial Patterns in Abundance of E. coli
–Abstract unavailable

2:20–2:40 pm Leska S. Fore, Statistical Design[1] and William H. Clark, Idaho Power Company[2]
Statistical Power Analysis of Alternative Sampling Designs To Evaluate the Influence of Snake River Hydroelectric Projects on Listed Snail Species

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We compared the statistical power of two alternative sampling designs for detecting changes in threatened and endangered snail populations in the Mid-Snake River (Idaho). Our goal was to determine which sampling approach would have the best chance of detecting a change associated with flow fluctuations resulting from different hydroelectric project management scenarios. We summarized the data as (1) the average number of snails collected across quadrats (density/m^2) and (2) the proportion of quadrats with snails present. We calculated the minimum detectable difference that each measure could detect using a two-sample *t* test. The proportion measure was more sensitive than the density measure for detecting change. Even a complete loss of snails failed to represent a statistically significant change in density for most sites due to high variability associated with quadrat counts. Log transformation of density and an increase in the number of sample quadrats had minimal effect on the sensitivity of snail density to detect a change. In contrast, we could detect a 38% change in the proportion of sites with snails present based on 16 sample quadrats. When the number of quadrats was increased to 30, a 28% change could be detected and for 50 quadrats a 19% change. In addition to being a more sensitive indicator, the proportion measure is quicker to obtain in the field which means that more sites can be sampled during the same amount of time.

3:10–3:30 pm Brian Hoelscher, Idaho Power Company[1] and Jack Harrison, HyQual[2]

Macrophytes: Accounting for the Unaccounted

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Excessive levels of aquatic macrophytes have been observed in the Snake River from King Hill, Idaho to C.J. Strike Reservoir. The macrophytes excrete oxygen demanding materials directly into the water column. Additionally, macrophytes drift into the reservoir and likely settle into the sediments contributing to reservoir sediment oxygen demand.

Idaho Power Company is currently sampling to assess the mass loading of macrophytes to C.J. Strike Reservoir. This organic matter, referred to as coarse particulate organic matter, is too large to be collected using traditional depth-integrated water column sampling techniques. Sampling results have been used to improve boundary conditions for the ecological water quality model (CE-QUAL-W2) used to assess dissolved oxygen dynamics for C.J. Strike Reservoir, as part of the King Hill–C.J. Strike Reservoir Total Maximum Daily Load.

3:30–3:50 pm Michael Murray, HDR Engineering

Phosphorus Fate, Transport and Treatment from Individual Treatment Systems – Current State of Knowledge and Issues Facing Idaho

–Abstract unavailable

3:50–4:10 pm Sherrill Doran, CH2M Hill, Don Essig, Idaho Department of Environmental Quality, and Robbin Finch, City of Boise

Proposed Statewide Fish Tissue Monitoring Program for Mercury

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The Idaho Department of Environmental Quality (IDEQ) began a negotiated rulemaking process for mercury in 2003. The primary issue facing IDEQ and the rulemaking committee was developing guidance for implementing the new methylmercury fish tissue criterion. In fact, Idaho is the first state to address this issue because EPA has not yet provided federal guidance on the methylmercury fish tissue criterion. The guidance presents methods for implementing a fish tissue criterion, the formula used to calculate the methylmercury criterion, the Idaho-specific fish tissue criterion, incorporation of local data to the extent that is both practicable and warranted, and an overview of how the fish tissue criterion can be implemented into the TMDL and NPDES programs.

Importantly, the guidance also contains a monitoring plan for a statewide monitoring approach that provides both flexibility for stakeholders and reliable data that can be used to make informed decisions. The primary advantage of relying on fish tissue monitoring is that concentrations of mercury in fish tissue represent an integrated exposure to mercury throughout a water body and the lifespan of a fish (e.g. more useful spatial and temporal scales). Because fish tissue collection is difficult, somewhat expensive, and time consuming and because a standardized approach provides better data, Idaho is proposing to develop a statewide cooperative fish tissue monitoring program. This approach is similar to programs that have

been developed in other states. While stakeholders would not be required to participate, it is envisioned that contributing to the statewide cooperative program would provide substantial economic benefits to dischargers while yielding substantial technical and environmental protection advantages to the state.

The Idaho statewide cooperative monitoring program is currently envisioned to rely on a tiered monitoring approach. Firstly, the monitoring program will include both deterministic (targeted) and probabilistic (random) monitoring, which will vary depending upon water body type, size, and levels of fishery use. Opportunities to review and modify the structure of the fish tissue monitoring program will be available throughout the life of the program, ensuring that data remains useful for identifying impaired waters and establishing fish consumption advisories, and ensuring that the protocol is adapted as necessary to meet additional or modified goals. Secondly, the monitoring program will produce data from a multitude of water body types (i.e., reservoirs/lakes, streams, rivers, warm and cold water systems, etc.), which are located across a large and varied land area (i.e., mountain, high desert, etc.). Finally, the monitoring program will use Hydrologic Unit Codes (HUCs) established by the USGS to create a manageable sampling framework that is consistent with the WBAG process.

The statewide monitoring framework is still evolving. Many important details, such as allocation of costs, remain to be resolved. In the interim, and for those dischargers who opt to not participate in the cooperative program, the guidance also describes recommendations for facility-related ambient monitoring.

4:10–4:30 pm Stephen R. Clayton, Philip Williams and Associates, Ltd.

Quantifying Physical and Biological Responses to Stream Restoration—Examples from Red River, Idaho

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Many stream restoration projects are funded and implemented on the premise that restoration of physical processes will result in improved biological conditions, but attributing biological responses directly to restoration can be difficult. Physical and biological parameters were monitored prior to (1994), during (1996–2000), and after (2001–2003) restoration of a 4.1 km reach of Red River, a tributary to the South Fork Clearwater in north-central Idaho. Quantification of physical responses incorporated annual monitoring of over 90 permanently monumented cross sections, longitudinal profiles, sediment characteristics at pool-tail outs, and water temperature. Species density and composition of resident and anadromous fish by age class were evaluated through annual snorkel surveys and Chinook salmon redd surveys. A hydrodynamic model and a heat transport model, extending 11.2 km beyond the restored reach, were developed to assess potential habitat improvements to future changes at the reach and watershed scales. While biological responses to date have been variable, monitoring and modeling results indicate physical processes are trending in the targeted directions. Integration of findings from multiple prospective studies, developed within a coordinated and structured monitoring context, may facilitate opportunities to explain some reach-scale biological variability and to attribute and evaluate responses of specific restoration actions at watershed scales.

4:30–4:50 pm Stephen R. Clayton, Philip Williams and Associates, Ltd.
Physical Processes and Bull Trout: Prioritizing Restoration Opportunities in Lightning Creek Watershed, Northern Idaho

967 E. Parkcenter Blvd. #246, Boise, ID 83706, (208) 433-9200 (W), 208-433-9250 (F), *s.clayton@pwa-ltd.com.*

Lightning Creek, a tributary to Lake Pend Oreille in northern Idaho, drains a 316 km^2 watershed characterized by frequent rain-on-snow events, steep slopes, and an abundant supply of glacial till. The drainage provides important habitat for bull trout, and large portions of the watershed were intensively roaded and harvested from the 1950s to the 1970s. In coordination with a technical committee composed of state and federal agency representatives, the PWA team assessed how physical processes and past land management have influenced slope and channel stability and aquatic habitat complexity. Our work included analysis of historic and current aerial photos and GIS coverages to identify and characterize sediment source, transport, and response reaches; field surveying of stream channels and abandoned roads; and assessment of changes in cross sections at a USGS cableway near the mouth. We developed a prioritized, long-term plan with recommendations at the subwatershed and geomorphic reach scales for addressing problems currently impacting bull trout habitat. Findings from the assessment will be used to coordinate, implement, and monitor restoration activities throughout the watershed (following the NEPA process); develop a management plan for fish passage, sediment management, and flood control near the mouth of Lightning Creek; and leverage future opportunities for restoration funding in the watershed.

WEDNESDAY, JANUARY 5, 2005

8:00–8:20 am David Blew, Idaho Department of Water Resources[1], and Dorene MacCoy, U. S. Geological Survey[2]

A Historical Perspective on Parafluvial Surfaces on the Lower Boise River

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[2] 230 Collins Road, Boise, ID 83702, (208) 387-1354, *demaccoy@usgs.gov*

In less than two centuries the Lower Boise River in south western Idaho has transformed from a meandering, braided, gravel-bed river that supported large runs of salmon to a working river within a large metropolitan area and that provides irrigation water to over 810 km^2 of agricultural land. The construction of 3 large dams in the upper basin has dramatically altered both the flow regime and sediment supply to the lower river. Flows are no longer sufficient to mobilize bed sediments and have allowed for cottonwood trees and exotic hardwoods to stabilize parafluvial surfaces that have also caused narrowing of sections of the river channel. Gravel and sand bars, historically present throughout the river and are necessary to maintain biodiversity and productivity, are scarce in the current river channel. Cadastral survey notes of 1867 and 1868 and aerial photography from 1939 used to describe and illustrate fluvial features associated with the lower Boise River basin and identify characteristics of the river channel prior to dam construction and urbanization. Current aerial photography is used to illustrate the lack of parafluvial surfaces within the river system today. The lower Boise River of today is a working river that provides for recreation, urban and commercial uses and supports a large agricultural community. The lower Boise River needs to be viewed as the result of a complex history of alterations. Understanding the historical processes that culminated into the current ecosystem condition will improve river restoration efforts.

8:20–8:40 am Brad Gilmore, City of Boise

Temperature Monitoring in the Boise River Basin, 2000–2004

–Abstract unavailable

8:40–9:00 am Brad Gilmore, City of Boise

Modeling and Simulation of Instream Temperatures of the Lower Boise River

–Abstract unavailable

9:00–9:20 am Brad Gilmore, City of Boise

E. coli Monitoring of the Boise River Urban Corridor, 2003–2004

–Abstract unavailable

10:00–10:20 am Dorene MacCoy, U.S. Geological Survey

Trends in Water Quality and Biological Integrity of the Lower Boise River

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The water quality and biotic integrity of the lower Boise River between Lucky Peak Dam and the river's mouth near Parma, Idaho, have been affected by agricultural land and water use, wastewater treatment facility discharge, urbanization, reservoir operations, and river channel alteration. The U.S. Geological Survey (USGS) and cooperators have studied water-quality and biological aspects of the river in the past to address water-quality concerns and issues brought forth by the Clean Water Act of 1977. Past and present issues include preservation of beneficial uses of the river for fisheries, recreation, and irrigation; and maintenance of high-quality water for domestic and agricultural uses. Evaluation of the data collected from 1994 to 2002 by the USGS revealed suspended sediment, nutrient, and bacteria concentrations increase downstream. Chlorophyll-*a* concentrations, used as an indicator of nutrient input and the potential for nuisance algal growth, also increased downstream; median concentrations were highest at the Middleton and Parma sites. There were no discernible temporal trends in nutrients, sediment, or bacteria concentrations over the 8-year study.

Macroinvertebrates and fish communities were used to evaluate the long-term integration of water-quality contaminants and loss of habitat in the lower Boise River. Biological integrity of the macroinvertebrate population was assessed using metrics such as Ephemeroptera, Plecoptera, and Trichoptera (EPT) richness. Average EPT at river sites was about 10, half that of least-impacted streams in Idaho. The percent tolerant species indicated that populations mainly at Middleton and Parma were typical of those in degraded water quality and habitat. Recent data show that the occurrence of the invasive mollusk, the New Zealand Mudsnail, *Potamopyrgus antipodarum*, has reduced the biodiversity of the macroinvertebrate population in the river.

The biological integrity of the fish population was evaluated using the Idaho River Fish Index (RFI), which consists of 10 metrics, such as the number of coldwater native species, percent sculpin, and the number of nonindigenous species. RFI scores for the lower Boise River sites indicated a decrease in biotic integrity of fish downstream; the lowest RFI score, indicating poor biotic integrity, was at Parma, near the mouth of the river.

The USGS continues water quality and biological integrity monitoring in the lower Boise River to help evaluate efforts to reduce sediment and nutrient load, and to restore habitat. The USGS will also employ new techniques, such as the use of an Acoustic Doppler Current Meter as a surrogate for suspended sediment and a continuous auto-sampler to gather durational nutrient data at Parma in order to address TMDL needs.

10:20–10:40 am Kevin Davis, U.S. Forest Service

Construction, Maintenance, and Monitoring of a Geo-timbergrid Structure

–Abstract unavailable

10:40–11:00 am James A. Chandler[1] and Phillip A. Groves[2], Idaho Power Company

A Comparison of Habitat Quality Between Historic and Contemporary Fall Chinook Spawning Habitat in the Snake River, With Implications About Reintroduction and Recovery

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Prior to development in the Snake River, fall chinook salmon spawned throughout the length of the Snake River between Shoshone Falls (the upstream natural terminus) and the confluence with the Columbia River, a distance of approximately 990 km. Areas upstream of the Hells Canyon Complex (HCC) were believed to be the most productive spawning areas for fall chinook salmon. Over a period of approximately 70 years, fall chinook habitat in the Snake River was reduced to approximately 160 km between Hells Canyon Dam (the present upstream terminus) and Lewiston, Idaho. After construction of the Swan Falls Dam in 1901, and prior to construction of Brownlee Reservoir in 1958 (the uppermost reservoir in the HCC), the majority of fall chinook production in the Snake River occurred in a 53 km section between Swan Falls Dam and Marsing, Idaho.

We examined the chronology and influence of development (dam construction and multiple land-uses) on Snake River fall chinook relative to altered thermal regimes, water quality and the historic and present-day status of Snake River fall chinook salmon. Factors examined included influences of development on timing of spawning, emergence and migration and relative incubation survival.

11:10–11:30 am Brad Higginson[1] and Lee Leffert[2], U.S. Forest Service

Water Quality and BMP Implementation/Effectiveness Monitoring on the Caribou-Targhee National Forest

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[2] (208) 557-5783, *lleffert@fs.fed.us*

In 2004, the Caribou-Targhee National Forest performed water quality monitoring within the Blackfoot River and the Portneuf River Subbasins as discussed in the Forest's Total Maximum Daily Load (TMDL) Implementation Plans for those subbasins.

TMDL monitoring within the Blackfoot River Subbasin included bank stability and depth fines measurements on the Blackfoot River and eight (8) tributary streams within the Forest boundary. Several streams in the Blackfoot River Subbasin exceeded surrogate load allocations. However, field reviews indicate that depth fines may not be an appropriate parameter in these fine grain stream types and valley bottoms. Monitoring within the Portneuf River Subbasin included suspended sediment, depth fines, and nutrient sampling on four (4) tributary streams to the Portneuf River. Some locations within the Portneuf Subbasin exceeded the surrogate load allocations.

BMP implementation and effectiveness monitoring has been ongoing on the Forest since 1990. Since that time, 30 timber sales have been reviewed. In 2004, the Forest also began monitoring livestock grazing allotments. Monitoring was performed on the Bootjack Grazing Allotment located on the Ashton/Island Park Ranger District and Montpelier-Elk Valley Allotment located on the Montpelier Ranger District.

Results of the TMDL monitoring and BMP reviews are discussed. Some suggestions are made on how TMDL monitoring may be modified to gain a better understanding of current water quality and stream channel conditions and trends.

11:30–11:50 am Tim Burton[1] and Ervin Cowley[2], U. S. Bureau of Land Management

Multiple Indicator Monitoring of Streamside Livestock Grazing – Can we improve efficiency and assure quality and usefulness of the data?

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[2] (208) 373-3810, *Ervin_Cowley@blm.gov*

Monitoring effects of livestock grazing on streams and associated riparian areas has traditionally involved a number of key variables including: stubble height, bank disturbance or alteration, and browsing of woody plants as indicators of livestock use; and streamside or greenline vegetation composition, streambank stability, and woody species regeneration as indicators of ecosystem condition and trend. Unfortunately existing monitoring protocols have made it difficult to apply all of these indicators at the same time and place, because existing approaches make multiple indicator monitoring too time consuming. Consequently many have simply used a livestock use indicator, such as stubble height, as the surrogate for riparian and stream habitat condition and trend. A team of experts recently concluded that this is inappropriate and that the use of stubble height as a performance standard is not possible without some local validation that the stubble height actually achieves the riparian objectives. In addition, riparian indicators such as bank stability may vary through time according to natural disturbance. Without a linkage to livestock use, it is difficult to assure that observed trends are actually reflecting livestock management and not natural variations. Thus the need for a more efficient approach to multiple indicator monitoring – allowing comparison of livestock use to riparian condition at each monitoring site. We describe a new approach designed to do just that.

THURSDAY, JANUARY 6, 2005

8:00–8:20 am Bruce Sims[1] and Chris Knopp[2], U.S. Forest Service

Is 4–B Classification an Alternative to TMDLs on USDA Forest Service Lands?

[1]Regional Hydrologist, Northern Region, USDA Forest Service, 200 E. Broadway, Missoula, MT 59807
[2]National Water Quality Program Leader, USDA Forest Service

Total Daily Maximum Load Analyses (TMDLs) are being conducted nation wide to address 303(d) listed waters. TMDL strategy involves development of specific numeric targets designed to attain water quality standards. Defensible targets are more easily established for point source discharge where the volume of contaminant can be adjusted in accordance to the water body discharge. Setting TMDL targets has proved problematic in wildland forest environments when applied to non-point source pollutants such as sediment. Definitively discerning between the man caused and natural sediment discharge is difficult. Natural sediment discharge is highly variable as a result of complex watershed interactions driven by stochastic disturbance events (fire, draught, flood, wind, insects and disease) or channel adjustments that once initiated may persist for decades longer. The expense of data collection needed to establish targets may in some cases exceed the cost of accomplishing needed watershed restoration. July 2004 EPA Guidance states that where agencies can bring the force of regulation to achieve water quality standards through other means, a TMDL is not required (Category 4B). This paper describes discussions held between Forest Service personnel, State Department of Environmental Quality and Region 8 EPA partners to explore the possibility of establishing Category 4B status for a watershed with streams that are listed for sediment on the Gallatin National Forest in Montana.

8:20–8:40 am Randy Glover, Electronic Data Solutions[1]

Optical Dissolved Oxygen Sensors—Twice the Accuracy of an Electrochemical Clark Cell Sensor While Calibrating Just Once per Year

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randy@elecdata.com

The optical, dissolved oxygen sensor, or RDO, from In-Situ, Inc. (Ft. Collins, CO) is based on the excitation and detection of luminescent material that has a fluorescence lifetime directly proportional to the presence of molecular oxygen. Specifically, the measurement of dissolved oxygen is based on the ability of oxygen to act as dynamic fluorescence quencher to a chemical species which upon photo-excitation produces fluorescent photoemission during its relaxation. For oxygen, if a ruthenium-complex is illuminated with a blue light emitting diode (LED) the ruthenium-complex will be excited and emit a red luminescent light during its decay back to the original state. The blue-light excitation is applied during a very short time interval resulting in red luminescent light that is emitted with an intensity that decays over time. The red-light intensity decay rate, or lifetime, is directly proportional to the ambient oxygen concentration. Dissolved oxygen is thus determined by the precise measurement of the luminescent lifetime of the fluorescent chemical species, resulting in accuracies twice that of electrochemical methods.

Unlike electrochemical dissolved oxygen measurement, luminescent lifetime based dissolved oxygen measurements do not perturb the dissolved oxygen concentrations during the measurement. Luminescent measurement techniques do not consume or otherwise remove oxygen from the water during the measurement. As a result, luminescent dissolved oxygen measurement is not flow sensitive, has no initial stabilization time and has no performance drift from normal wear.

Having no performance drift from normal wear means calibrations are required but once per year, allowing for significant savings in terms of cost of ownership. Aside from the obvious savings in reduced maintenance costs, savings resulting from reduction in the number of field trips (including vehicle and labor expenditures) would likely exceed the price of the instruments.

Conversely, the Clark Cell D.O. sensor is costly due to intensive labor and maintenance requirements. The sensor is, by design, built to foul and eventually expire. It consumes electrolyte that must be replenished. Its electrochemical process, as well as water conditions, produce fouling residue requiring frequent membrane replacements. Eventually, the Clark Cell consumes itself and must be replaced.

Clark Cell D.O. sensors gave us fifty years of service but, like the typewriter, its technology has now been surpassed. The advantages of optical D.O. technology are simply too significant.

8:40–9:00 am Greg Clark, U.S. Geological Survey

Historical Trends in Stream Discharge at Long-Term Gaging Stations in Idaho

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Documenting long-term patterns or trends in natural stream discharge is important for understanding and managing the water resources of Idaho. Recent studies suggest that changes in atmospheric conditions in areas of the northwestern United States may have altered the hydrologic characteristics of some streams. Changes in the discharge characteristics of Idaho's streams could result in large changes in the timing of runoff and the availability of water. Records at long-term gaging stations provide data with which to document natural changes in stream discharge during the past 100 years and provide insight into future possible hydrologic changes.

To examine patterns and trends in stream discharge, 8 gaging stations located on unregulated streams in Idaho and Wyoming and with more than 50 years of continuous record were examined. Although differences in the historical discharge characteristics exist among stations, some consistent patterns and trends are evident. At many of the stations examined, the annual mean stream discharges during water years 2000–04 were among the lowest on record, and if low stream discharge conditions persist during the next 5 years, the first decade of the 21st century in Idaho will be the driest since the 1930's. Since 1980, the temporal pattern of spring runoff has become increasingly variable, with some of the wettest and driest water years on record occurring during the same time period. Between 1980 and 2004, the average peak discharge at 7 of 8 stations was smaller and occurred earlier, compared with the average peak discharge prior to 1980. On average, the first quartile of annual runoff occurred about 1 week earlier between 1980 and 2004, compared with the pre-1980 average.

9:00–9:20 am Tom Dechert, Idaho Department of Environmental Quality

The GIS-RUSLE Model Made Simple for TMDLs

–Abstract unavailable

9:20–9:40 am Clyde Lay, Idaho Department of Environmental Quality

Remote Sensing as a Tool to Predict Lake and Reservoir Water Quality in Southern Idaho

–Abstract unavailable

10:20–10:40 am Jon Hortness, U.S. Geological Survey

Developing Regression Equations to Estimate Annual Low-Flow Statistics at Ungaged Sites: Project Overview

230 Collins Road, Boise, ID 83702, (208) 387-1319, *jehortne@usgs.gov*

Management and evaluation of the effects of wastewater from communities, industries and agriculture often requires an understanding of low flow in streams. Statistics such as the 7-day, 2-year (7Q2) and 7-day, 10-year (7Q10) low flows are commonly used by regulatory agencies when determining water quantity and/or water quality standards. In the absence of measured streamflows, low-flow values are often assumed. In Idaho, more than 800 river reaches have been designated as impaired (exceeding water-quality and/or biological criteria) by Total Maximum Daily Load (TMDL) assessments. To determine the load of a constituent in a stream, streamflow information is needed. This information is especially needed by State and Federal water-quality regulators in establishing TMDL's and setting effluent limits for NPDES (National Pollutant Discharge Elimination System) discharge permits.

The U.S. Geological Survey operates a network of streamflow gaging stations in Idaho that provides streamflow data for a variety of purposes. Because it is not feasible to operate gaging stations at all locations where TMDL's, discharge permits, and/or other water-management decisions must be made, the statistical characteristics of these data often are used to make inferences about streamflow characteristics at ungaged sites. This is accomplished with regionalization techniques, which often include regression analyses relating streamflow-frequency statistics to selected physical and climatic characteristics of drainage basins.

The state was divided into regions during previous studies and those regions will be used for this study. The data from the relevant gages in each region will be used in regression analyses to develop a relation between the flow statistic and basin and climatic characteristics. Continuous-record gaging stations in Idaho and surrounding states with 10 or more years of daily-mean streamflow records will be analyzed and the relevant frequency statistics (7Q1, 7Q2, 7Q10, and 30Q5) will be computed. Basin and climatic characteristics for the drainage areas of these gages will be determined using a geographic information system (GIS). The GIS makes use of digital datasets of characteristics such as elevation, precipitation, land-use, and temperature to determine the basin and climatic characteristics for the drainage area of each gage. A generalized least squares (GLS) regression analysis will be used to determine the final equations. The final predictive equations will allow users to estimate annual low-flow statistics at ungaged sites on streams across Idaho.

10:40–11:00 am Sherrill Doran, CH2M Hill
Innovative Instream Sediment BMP Technologies
–Abstract unavailable

11:00–11:20 am Stacy Smith, University of Idaho
Idaho Rural Road Maintenance Best Management Practices (BMP)

Project Leader, Best Management Practices (BMPs), Idaho Technology Transfer (T2) Center, University of Idaho, P.O. Box 440911, Moscow, ID 83844-0911, (208) 885-4510, *stacy@idahovandals.com*

It is a common understanding that roads contribute a great deal to overall water quality in wildland environments. Several years ago, a need for interagency collaborative road maintenance practices was identified by representatives from the BLM, Forest Service, DEQ and Custer County. Funding has been secured for the initial phase of this project, which includes developing a manual and a series of training programs covering Best Management Practices (BMPs) for rural road maintenance in Idaho.

Work began during the summer of 2004 by locating BMPs from other states, identifying concerns from the regulatory and land-management perspective as well as the road maintenance perspective. A committee of representatives from regulatory agencies was re-established and has met several times. Participants on the committee include: the Local Highway Technical Assistance Council, Idaho Department of Environmental Quality, Idaho Fish & Game, U.S. Army Corps of Engineers, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service, NOAA Fisheries, Idaho Department of Lands, Environmental Protection Agency, and Idaho Technology Transfer (T2) Center (and the list is growing). Also, a focus group of road supervisors from around the state was formed to represent the local highway jurisdictions throughout the process of creating the manual and training programs.

The role of the focus group and committee are to ensure that all major concerns are addressed and practical procedures are provided in the manual. The committee and their agencies will assist the T2 Center in establishing training and certification criteria throughout Idaho.

11:20 am–12:00 noon Ross A. Spackman, Ph.D., Candidate, University of Idaho
The Influence of Polyacrylamide (Pam) on Nutrients in Furrow Irrigated Pastures

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Polyacrylamide (PAM) has been shown to decrease soil erosion in furrow irrigated fields. Electrical charge interactions bind soil particles preventing detachment. Any suspended particles flocculate and settle rapidly, reducing transport and loss in runoff. We hypothesized that the same interactions would occur with nutrients found in animal wastes on irrigated pastures. Dairy lagoon waste water was applied to select furrows in the plot pre-irrigation. Surface, ground water, and soil samples were collected at 30, 60, and 90 meters down each furrow. Also, surface water collections were made at intervals of 2, 4, and 8 hours after initiation of irrigation. Infiltration and sediment loss were also calculated.

In furrows with PAM application there were usually elevated nutrient levels at the end of the field. Ortho P increased 76% and total P 75% between 30 and 90 meters. The form of applied PAM, dissolved or dry patch, was not consistently significant. Nutrient concentrations in runoff declined from start to end of the irrigation cycle. No evidence of deep leaching of phosphorus was seen in soil samples. No difference in sediment loss was seen between treatments either. Furrow runoff was higher and infiltration was lower on PAM treatments compared with no PAM application.

POSTERS

Johnna Evans and Peter Koetsier, Boise State University
Development of Biotic Metrics to Distinguish Between Least Impacted and Impacted Desert Springbrooks in Southwest Idaho
–Abstract unavailable

Bob Kenworthy, U.S. Forest Service
Sediment Transport and Production from Two Small Watersheds in Central Idaho
–Abstract unavailable

Gary A. Lehrsch[1], L. Wright, and D.T. Westermann, USDA, Agricultural Research Service
NO3-N and Bromide Breakthrough in a Sprinkler-Irrigated Portneuf Silt Loam

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Excessive irrigation can leach agricultural chemicals and nutrients through the vadose zone to contaminate ground water. A four-year field experiment near Kimberly, ID, was designed to study the transport of water, using applied Br as a tracer, and native nitrate through a Portneuf silt loam (Durinodic Xeric Haplocalcid) cropped to dry bean (*Phaseolus vulgaris* L.) in growing season 1, and a mixed sward of HiMag tall fescue (*Festuca arundinacea* Schreb.) and ryegrass (*Lolium* spp.) in seasons 2 & 3. We irrigated the field using a solid-set irrigation system and a leaching fraction of 22% in season 1, 30% in season 2, and 35% in season 3. We measured native N in soil samples, precipitation and irrigation using rain gages, soil water contents using a neutron probe, and solute concentrations in soil solution samples taken from depths of 0.3 to 4.3 m. Solute movement and dispersion by depth were characterized using breakthrough curves of relative concentration (C/C0) plotted versus time. Bromide peak concentration decreased and movement slowed as the solute pulse moved downward through the profile. Nitrate-N and Br were transported through this irrigated and cropped silt loam by both matrix flow and spatially varying preferential flow. Nitrate-N or Br moved preferentially through Portneuf profiles at 6 of 8 monitored sites, commonly to depths of 0.9 m and less commonly to depths from 1.5 to 4.3 m. Leaching of mobile solutes through preferential flow paths in southern Idaho Portneuf soils is likely, even when irrigating with a judicious leaching fraction of 22%.

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Aquatic Organism Passage at Culvert Crossings on the Sawtooth National Forest: Challenges and Opportunities

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The Sawtooth National Forest recently completed a road/stream fish passage assessment in 2003 and 2004. The purpose of this assessment was to better describe the extent of culvert barriers across the forest to fish species and threats to water quality from undersized culverts or poorly designed crossings. A national inventory and assessment developed by the San Dimas Technology and Development Center was used (Welcome to the FishXing Website at URL: http://www.stream.fs.fed.us/fishxing/). This field-based assessment examined a range of stream (channel gradient, bank full width, fish presence etc.) and road crossing (crossing type, dimensions, slope, perch height, general condition) attributes. All road-stream crossings on anadromous and resident trout streams were inventoried and their condition documented. Validated data was entered into the national "Fishpass" database.

Approximately 200 culverts on fish bearing streams were inventoried. Of the evaluated culverts, about 66% are a barrier to adults and 81% a barrier to juveniles salmonids. Culverts block an estimated 150 miles of fish habitat across the forest. Reduced access increases risks to fish populations by blocking valuable spawning and rearing habitat, and restricting passage to refuge areas during disturbances (e.g. fire, floods, etc.). Culverts accounted for 98% of the crossings that impair upstream passage to salmonids. Greater than 60% of the crossings were found to have a high potential for diverting stream flows if their capacity was exceeded. This poses a high risk to degrading water beneficial uses such as aquatic life (e.g. cold water, salmonids spawning, etc.) during storm and high runoffs events. Assessment information has helped to fully describe the extent and geographic distribution of these issues on the forest. Assessment results are being used with the forest's "Watershed Restoration and Recovery Strategy" to prioritize culverts restoration across the forest. However, estimated costs of replacing all barrier culverts will be steep and could exceed $20,000,000. Still, addressing barrier and undersized culverts will be a critical part in any restoration approach. Replacement of poorly designed stream crossings will reduce sediment sources that impair beneficial uses and will aid in the recovery of fish species protected under the Endangered Species Act by expanding access to former habitat.

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Phosphorus and Suspended Load Estimates for the Lower Boise River, Idaho, 1994–2002

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Load estimation software (LOADEST) was used to develop regression equations and estimate loads of total phosphorus (TP), dissolved orthophosphorus (OP), and suspended sediment (SS) at four sites on the lower Boise River for January 1994 through September 2002: Boise River below Diversion Dam near Boise, Boise River at Glenwood Bridge at Boise, Boise River near Middleton, and Boise River near Parma. The objective was to help the Idaho Department of Environmental Quality develop and implement total maximum daily loads (TMDLs) by providing spatial and temporal resolution for phosphorus and sediment loads and enabling load estimates made by mass balance calculations to be refined and validated. The average estimated daily TP load ranged from less than 250 pounds per day (lb/d) at Diversion to nearly 2,200 lb/d at Parma. Annual loads of TP ranged from less than 8 tons at Diversion to 570 tons at Parma. Annual loads of dissolved OP peaked in 1997 at all sites and were consistently higher at Parma than at the other sites. The ratio of OP to TP varied considerably throughout the year at all sites. Peaks in the OP:TP ratio occurred mainly when flows were at their annual lowest; seasonal OP:TP ratios were highest in autumn at all sites. Conversely, when flows were highest, the ratio was lowest, reflecting increased TP associated with particulate matter during high flows. Parma exhibited the highest OP:TP ratio during all seasons, at least 0.60 in spring and nearly 0.90 in autumn. Similar OP:TP ratios were indicated at Glenwood.

Monthly average SS loads were highest at Diversion, about 400 tons per day (ton/d). Average annual loads from 1994 through 2002 were 144,000 tons at Diversion, 33,000 tons at Glenwood, and 88,000 tons at Parma. SS loads peaked in the spring at all sites, coinciding with highest flows.

Statistically significant ($p < 0.05$) downward temporal trends in load were determined for SS at Glenwood, for OP at Middleton, and for TP, OP, and SS at Parma. A significant upward trend in TP was determined at Diversion. LOADEST average daily TP load estimates indicated that reductions in load of 28 to 79 percent at Parma would have been necessary to meet the proposed goal of 2,295 lb/d set forth in the Snake River-Hells Canyon TMDL. Estimated average daily loads of SS at Parma from 1994 through 2002 exceeded the current TMDL load allocation of 101 ton/d at Parma except in 2001.

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Assessing Phosphorus Inputs in a Southeastern Idaho River Through Measurements of Macrophyte Biomass: An Ecosystem Impact Perspective

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Eutrophic conditions, currently taking place, were assessed in a section of the Portneuf River through the measurement of biomass of detached and free floating macrophytes. At each of two sites approximately one mile apart I placed three collection nets within the river to trap incoming macrophytes. Plant material collected on the nets during known time intervals was dried, weighed, and ground. Subsamples of the dried material were then digested for quantification of Phosphorus content. I extrapolated excess phosphorus inputs into the system from the amount of macrophyte biomass captured on a daily basis. I also measured total Phosphorus in water samples collected at or near each study site. Average P concentration of samples is more than ten times higher at the down stream site, which also has significantly higher rates of macrophyte capture. These data indicate that higher levels of phosphorus are entering the system within this reach of the Portneuf River, and that there is significant eutrophication taking place as a result of phosphorus inputs.

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New Zealand Mudsnail in Idaho Rivers

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The invasive species, New Zealand mudsnail (*Potamopyrgus antipodarum*), has been collected in stream and rivers of Idaho. Since 1993, mudsnails have been found at 26 of the 57 sites sampled by the U.S. Geological Survey as part of the Idaho Statewide Water-Quality Monitoring Network, the lower Boise River water-quality and biological studies, and the National Water-Quality Assessment Program. These 26 sites are located at 16 rivers, creeks, and springs in Idaho. Most sites where mudsnails have been found are in southern Idaho in the Snake River and its tributaries. The density of mudsnails in riffle habitat has increased at certain sites by two orders of magnitude. The most extreme density change was at the Snake River near Buhl, where mudsnail density increased from less than 2,000 per square meter in 1996 to more than 700,000 per square meter in 2003. At the Boise River near Middleton, Snake River near King Hill and Buhl, and Rock Creek above Highway 30/93 near Daydream Ranch, total invertebrate taxa have declined 40 to 80 percent. This decline appears to coincide with the occurrence of the New Zealand mudsnail and is likely to have detrimental effects on the aquatic food chain by decreasing the food base for other organisms to survive and decreasing biodiversity needed for a healthy community.